Sub A1

1. A process for forming a layer of low dielectric constant material having a predetermined thickness, comprising:

depositing a first layer of low dielectric constant material by means of plasma enhanced vapor deposition, at a first power level;

then depositing a second layer of the low dielectric constant material by means of plasma enhanced vapor deposition, at a second power level that is higher than said first power level; and

repeating the preceding two steps until the predetermined thickness is reached.

2. The process recited in claim 1 wherein the low k dielectric material is selected from the group consisting of fluorinated silicon glass, black diamond, carbonated silicon glass, and amorphous silicon glass.

3. The process recited in claim 1 wherein the first layer of low dielectric constant material is deposited to a thickness between about 700 and 1,000 Angstroms

4. The process recited in claim 1 wherein the second layer of low dielectric constant material is deposited to a thickness between about 700 and 1,000 Angstroms.

5. The process recited in claim 1 wherein said predetermined thickness between about 3,000 and 10,000 Angstroms.

6. The process recited in claim 1 wherein the first power level is less than about 70 watts.

7. The process recited in claim 1 wherein the second power level is between about 70 and 200 watts.

8. The process recited in claim 1 wherein the layer of low dielectric constant material has a flat band voltage that is less than about -3 volts.

9. A process for depositing a layer of black diamond on a silicon wafer to a predetermined thickness, comprising:

through chemical vapor deposition, from a first gaseous mixture of methyl silane and nitrous oxide, enhanced by a helium plasma at a power level that is less than about 70 watts, depositing a low power layer of black diamond for about 10 seconds, thereby forming a layer having a thickness between about 700 and 1,000 Angstroms;

then through chemical vapor deposition, from a second gaseous mixture of methyl silane, nitrous oxide, and oxygen, enhanced by a helium plasma at a power level of between about 70 and 200 watts, depositing a high power layer of black diamond for about 10 seconds, thereby forming a layer having a thickness between about 700 and 1,000 Angstroms; and

repeating the preceding two steps until said predetermined thickness is reached.

10. The process recited in claim 9 wherein said predetermined thickness is between about 3,000 and 10,000 Angstroms.

11. The process recited in claim 9 wherein, in the first gaseous mixture, the methyl silane has a flow rate that is less than about 200 SCCM, the nitrous oxide has a flow rate that is less than about 800 SCCM, and the helium has a flow rate that is less than about 3,000 SCCM.

12. The process recited in claim 9 wherein, in the second gaseous mixture, the methyl silane has a flow rate that is less than about 200 SCCM, the nitrous oxide has a flow rate that is less than about 800 SCCM, the helium has a flow rate that is less than about 3,000 SCCM, and the oxygen has a flow rate that is less than about 100 SCCM.

13. The process recited in claim 9 wherein the layer of black diamond that has said predetermined thickness has a flat band voltage that is less than about -3 volts.

Sub A3

14. A process for forming a dual damascene structure on a silicon wafer, comprising:

through chemical vapor deposition, from a first gaseous mixture of methyl silane and nitrous oxide, enhanced by a helium plasma at a power level that is less than about 70 watts, depositing a low power layer of black diamond for about 10 seconds, thereby forming a layer having a thickness between about 700 and 1,000 Angstroms;

then through chemical vapor deposition, from a second gaseous mixture of methyl

silane, nitrous oxide, and oxygen, enhanced by a helium plasma at a power level of between about 70 and 200 watts, depositing a high power layer of black diamond for about 10 seconds, thereby forming a layer having a thickness between about 700 and 1,000 Angstroms;

repeating the preceding two steps until a completed black diamond layer has been formed;

patterning and etching said completed black diamond layer in order to form a wiring trench;

patterning and etching said wiring trench down to the level of the silicon wafer, thereby forming a via hole;

depositing a layer of copper to a thickness sufficient to fill the via hole and to over-fill the wiring trench; and

by means of chemical mechanical polishing, removing copper until said wiring trench is just filled and there is no copper on any exposed surface outside the trench, thereby forming said damascene structure and whereby said damascene structure is free of cracking and peeling.

15. The process recited in claim 14 wherein said completed layer thickness is between about 3,000 and 10,000 Angstroms.

16. The process recited in claim 14 wherein, in the first gaseous mixture, the methyl silane has a flow rate that is less than about 200 SCCM, the nitrous oxide has a flow rate

that is less than about 800 SCCM, and the helium has a flow rate that is less than about 3,000 SCCM.

17. The process recited in claim 14 wherein, in the second gaseous mixture, the methyl silane has a flow rate that is less than about 200 SCCM, the nitrous oxide has a flow rate that is less than about 800 SCCM, the helium has a flow rate that is less than about 3,000 SCCM, and the oxygen has a flow rate that is less than about 100 SCCM.

18. The process recited in claim 14 wherein the completed layer of black diamond has a flat band voltage that is less than about -3 volts.

19. The process recited in claim 14 wherein the trench has depth of between about 3,000 and 10,000 Angstroms.

20. The process recited in claim 14 wherein the via hole has a width of between about 3,000 and 10,000 microns.